When Should We Stop Breeding Dairy Cows?[1]

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Introduction

Reproductive performance and milk production are important factors that affect the profitability of a dairy farm (De Vries 2006a; Galvão et al. 2013). Reproductive success in a dairy is typically measured by reproductive indices such as days open (DO), calving interval (CI), service rate, pregnancies per AI (PAI), and pregnancy rate. The decision of when to start and when to stop breeding cows during a lactation is often a challenging one for dairy producers. The objective of this article is to present practical rules on how to determine when to stop breeding Holstein dairy cows based on persistency of milk production and break-even point for milk production.

Several studies have focused on when to start breeding cows, and, in general, a voluntary waiting period (VWP) of 50 to 60 days was optimal for average-producing cows while above-average cows benefited from longer VWP (Sørensen and Østergaard 2003; De Vries 2006d; Inchaisri et al. 2011). On the other hand, data on when to stop breeding cows that are not pregnant is more scant and more difficult to apply in field conditions, because the optimal time to stop breeding cows depends on parity, milk yield, and persistency of lactation (De Vries 2006a; Inchaisri et al. 2012). Inchaisri et al. (2012) observed that breeding should be stopped between 14 and 16 months in lactation in first-lactation cows, between 12 and 15 months in lactation in second-lactation cows, and between 10 and 13 months in lactation in third (or greater) lactation cows. Although the study by Inchaisri et al. (2012) provides some general guidelines, the results are probably only applicable when herd characteristics and economic parameters are similar to the ones assumed in that study. For instance, cull prices ($1.1/kg BW) were approximately 40% lower than what they are in the United States now ($1.54/kg BW; https://www.clal.it/upload/agpr0620.pdf). This is an important consideration because the value of a new pregnancy decreases dramatically with a smaller difference between cull price and heifer replacement cost (De Vries 2006a). In the spring of 2014, a 700 kg non-pregnant cow at the end of her lactation would have a cull price of about $1,400 and a replacement heifer would cost between $1,500 and $1,900 (http://www.ams.usda.gov/mnreports/jc_ls131.txt); therefore, there is less incentive to keep trying to get cows pregnant at the end of lactation or to keep cows in the herd that get pregnant at the end of lactation. Furthermore, keeping cows that get pregnant at the end of lactation leads to cows being dry for long periods (>70 days) which leads to increased risk of mastitis, decreased milk yield and reproductive performance, and increased risk of culling in the subsequent lactation (Pinedo and De Vries 2010; Pinedo et al. 2010; Pinedo et al. 2011).

So, knowing when a cow will stop being profitable (i.e., when income from milk will be less than cost of production) might help producers make a decision on when to stop breeding a cow.

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Materials and Methods

Data on persistency of milk production was acquired from previous publications (http://www.agromedia.ca/ADM_Articles/content/DHI_persist.pdf). Persistency of milk production using monthly tests was reported to be 95%, 91%, and 90% for first, second, and third (or greater) lactation, respectively. The optimum time to stop breeding was calculated in Microsoft Excel. The rule to stop breeding was that if the cow conceived, at dry-off she would still at least break even (i.e., income from milk = cost of production). The gestation length was 280 days and the dry period was between 40 and 71 days, so cows would be dried-off between 211 and 240 days of gestation. Based on the persistency of milk production and the break-even milk yield at dry-off (e.g., 40 lb), milk yield was back-calculated for eight 30-day periods to cover the period from conception to dry-off. Therefore, if milk yield was lower than what was calculated for the first period (the time of the breeding opportunity), it was expected that milk yield at dry-off would be lower than the break-even point, and consequently cows should not be bred anymore.

Results

Table 1 shows the expected milk yield for eight 30-day periods to reach a break-even point of 40 lb at dry-off. The interpretation of these results is that if a cow is not pregnant and her milk yield is similar to the first gestation period (0–30 days of gestation), the cow only has a maximum of 30 days to get pregnant before her expected milk yield at dry-off is below the break-even point. If the cow's milk yield is similar to the second gestation period (31–60 days of gestation), the cow should not be bred anymore, because if she gets pregnant during this period her expected milk yield at dry-off would be below the break-even point. Based on the calculated milk yield in the second gestation period, we can formulate an equation to determine the milk yield where breeding should be stopped. First, we calculate the coefficient by dividing the milk yield in the second gestation period by the target break-even milk yield at dry-off. The coefficients were 1.34, 1.68, and 1.77 for lactation 1, 2, and = 3, respectively. Therefore, to determine the milk yield at which breeding should be stopped, we multiply the coefficient by the target break-even milk yield (e.g., milk yield at which breeding should be stopped for a first lactation cow = 1.34 × target break-even milk yield at dry-off). Table 2 shows the milk yield at which breeding should be stopped for lactation 1, 2, and = 3, and break-even milk at dry-off of 35, 40, and 45 lb.

Conclusion

Herein we present a practical method to determine when to stop breeding cows based on persistency of milk production and break-even point for milk production. Nonetheless, this should not be the only criteria used to determine if a cow should continue to be bred. Evaluation of other parameters such as reproductive health (e.g., pyometra, uterine masses or abscesses), mammary gland health (e.g., mastitis, dead quarters, udder suspensory system), and general health (e.g., lameness, lymphoma) should also be considered. Furthermore, if replacement costs rise, the value of a new pregnancy would increase; therefore, increasing the benefit of trying to get cows pregnant for a longer time even if that incurs in a long dry period.

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Table 1. Calculation of expected milk yield for eight 30-day periods from conception to dry-off assuming a persistency of milk production of 95%, 91%, and 90% for first, second, and = third lactation, respectively, and a target break-even point of 40 lb at dry-off.

	Gestation period, days							
Milk	**0–30**	**31–60[1]**	**61–90**	**91–120**	**121–150**	**151–180**	**181–210**	**211–240**
Lact 1, lb	56	54	51	49	46	44	42	40
Lact 2, lb	73	67	62	57	52	48	44	40
Lact =3, lb	78	71	64	59	53	48	44	40

[1] If the cow's milk yield is similar to the second gestation period (31–60 days of gestation), the cow should not be bred anymore, because if she gets pregnant during this period her expected milk yield at dry-off would be below the break-even point.

Table 2. Milk yield at which breeding should be stopped based on break-even milk yield (calculated by multiplying break-even milk yield by 1.34, 1.68, or 1.77 for lactation 1, 2 or = 3, respectively).

	Milk yield at which breeding should be stopped, lb		
Break-even milk yield, lb	**Lact 1**	**Lact 2**	**Lact = 3**
35	47	59	62
40	54	67	71
45	60	76	80